The strongest inverse correlation was observed between ADC-mean and either SUV-mean or –SUV-max in tumor lesions.

References:

(1) Functional imaging of head and neck squamous cell carcinoma with diffusion-weighted MRI and FDG PET/CT: quantitative analysis of ADC and SUV. Varoquaux A, Rager O, Lovblad KO, Masterson K, Dulguerov P, Ratib O, Becker CD, Becker M.

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Increasing tumor grade separability by combining MR parameters

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Purpose/Introduction: MR diffusion, perfusion and spectroscopic data provide complementary information in brain tumor grading. We show that combining MR parameters of different modalities can improve diagnostic accuracy.

Subjects and Methods: MR data: MR data were acquired on a 3T Philips Achieva scanner from 5 glioma patients: 2 grade II astrocytomas, 1 grade II oligodendroglioma, 2 grade IV glioblastomas. DSC-MRI was acquired with a GE-EPI sequence: TR/TE=1350/30msec, with 60 dynamic scans during the first pass of a 0.1mmol/kg body weight bolus of Dotarem (Guerbet) injected at 4ml/sec. Cerebral Blood Volume (CBV) values were calculated using DPTools (www.fmritools.org). DKI data were acquired using an SE-EPI sequence: TR/TE=3200/90msec, δ/J=20/48.3msec, b=700,1000,2800sec/mm2. Mean Diffusion (MD) and Mean Kurtosis (MK) values were calculated as in [1]. MRSI data were acquired using PRESS volume selection, TR/TE=2000/35msec, MOIST water suppression, receiver bandwidth=2000Hz. AQSES-MRSI [2] was used for metabolite quantification. All imaging modalities were coregistered to anatomical data.

Analysis: Perfusion and diffusion maps were normalized with respect to NAWM. 5 parameters were considered: CBV, MD, MK, Lips/TCho (Lipids over total Choline) and Cre/sum (Creatine over summed metabolites). All voxels in the active tumor ROIs were included, resulting in class C1 of 1821 low-grade glioma voxels and class C2 of 873 high-grade glioma voxels (Fig.1).

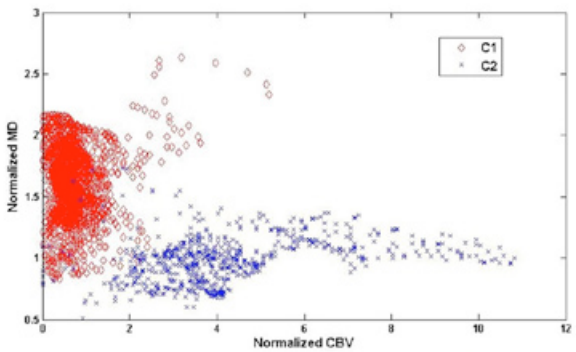

Fig.1: Scatter plot of CBV versus MD for LGG class C1 and HGG class C2

Intra-class Homogeneity and inter-class Separation were computed:

$$Hom_{C_i} = \frac{1}{N_{C_i}} \sum_k D(x_k, \mu_{C_i})$$

$$Sep_{C_i,C_j} = D(\mu_{C_i}, \mu_{Cj})$$

with N_{Ci} the number of data points in class C_i, D a distance measure, x_k the k^{th} point in class C_i and μ_{Ci} the class centroid. Mahalanobis is used as distance measure, taking into account the directional spread of the data. Based on *Hom* and *Sep*, the HS-index is calculated:

$$HS_{C_i,C_j} = Sep_{C_i,C_j} - Hom_{C_i}$$

Results: Table1 and Table2 show HS-indices of C1 with respect to C2 and vice-versa. The HS-values on the diagonal are for 1 parameter only. Green cells indicate the combinations for which the HS-index is increased with respect to both parameters' individual HS-values. The HS-value when combining all parameters is shown at the bottom of the table.

	Lips/TCho	Cre/sum	CBV	MD	MK
Lips/TCho	5,98	6,29	9,31	5,67	5,64
Cre/sum		0,59	6,30	1,09	0,71
CBV			6,64	6,80	6,45
MD				1,46	1,15
MK					0,44
All params	15,51				

Table 1: $HS_{C1,C2}$ values for combined MR parameters

	Lips/TCho	Cre/sum	CBV	MD	MK
Lips/TCho	1,01	2,04	1,22	2,66	1,40
Cre/sum		2,09	2,73	3,03	2,44
CBV			1,01	3,66	1,87
MD				2,72	2,69
MK					1,33
All params	6,67				

Table 2: $HS_{C1,C2}$ values for combined MR parameters

Discussion/Conclusion: The separability of tumor grade classes can improve by combining certain MR parameters. However, a slight decrease of the combined HS-index is found for other combinations. For all parameters combined, the HS-index is higher than for any combination of 2 parameters. Tumor grade separability can be maximized by considering the optimal combination of parameters.

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Longitudinal T1 mapping for the follow-up of patients with abdominal solid tumors

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Purpose/Introduction: Dynamic MRI with contrast injection is generally used to characterize the micro vasculature in patients with abdominal solid tumors. Response Evaluation Criteria in Solid Tumors (RECIST) [1] are conventional morphological criteria to evaluate the tumor response to a treatment. This work proposes a new approach based on the T1 mapping to quantify the tumor response.

Subjects and Methods: Seven patients with abdominal solid tumors were examined using a dedicated MRI protocol before and during the course of